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? s forisome?
      S1     121  FORISOME?
? s s1 and trypsin
             121  S1
          321303  TRYPSIN
      S2       0  S1 AND TRYPSIN
? s s1 and fabaceae
             121  S1
          370315  FABACEAE
      S3      32  S1 AND FABACEAE
? s s1 and vicia(3n)faba
             121  S1
           63637  VICIA
           50081  FABA
           45697  VICIA(3N)FABA
      S4      66  S1 AND VICIA(3N)FABA
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              66  S4
          916278  KDA
      S5       0  S4 AND KDA
? s s4 and weight
              66  S4
         4439913  WEIGHT
      S6       0  S4 AND WEIGHT
? s s4 and contract?
              66  S4
         1532044  CONTRACT?
      S7      55  S4 AND CONTRACT?
? s s7 and crystal?
              55  S7
         3045150  CRYSTAL?
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S8 5 S7 AND CRYSTAL?
? t s8/9,k/1-5

8/9,K/1 (Item 1 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

18527783 Genuine Article#: 373NM Number of References: 43
Title: GFP Tagging of Sieve Element Occlusion (SEO) Proteins Results in Green Fluorescent Forisomes
Author(s): Pelissier HC; Peters WS; Collier R; van Bel AJE; Knoblauch M (REPRINT)
Corporate Source: Washington State Univ,Sch Biol Sci,Pullman//WA/99164 (REPRINT); Washington State Univ,Sch Biol Sci,Pullman//WA/99164; Indiana Univ Purdue Univ,Dept Biol,Ft Wayne//IN/46805; Univ Giessen,Inst Allgemeine Bot,D-35390 Giessen//Germany/
Journal: PLANT AND CELL PHYSIOLOGY, 2008, V49, N11 (NOV), P1699-1710
ISSN: 0032-0781 Publication date: 20081100
Publisher: OXFORD UNIV PRESS, GREAT CLARENDON ST, OXFORD OX2 6DP, ENGLAND
Language: English Document Type: ARTICLE
Geographic Location: USA; Germany
Journal Subject Category: PLANT SCIENCES; CELL BIOLOGY
Abstract: **Forisomes** are Ca-2-driven, ATP-independent **contractile** protein bodies that reversibly occlude sieve elements in faboid legumes. They apparently consist of at least three proteins; potential candidates have been described previously as FOR proteins. We isolated three genes from Medicago truncatula that correspond to the putative **forisome** proteins and expressed their green fluorescent protein (GFP) fusion products in **Vicia faba** and Glycine max using the composite plant methodology. In both species, expression of any of the constructs resulted in homogenously fluorescent **forisomes** that formed sieve tube plugs upon stimulation; no GFP fluorescence occurred elsewhere. Isolated fluorescent **forisomes** reacted to Ca-2 and chelators by **contraction** and expansion, respectively, and did not lose fluorescence in the process. Wild-type **forisomes** showed no affinity for free GFP in vitro. The three proteins shared numerous conserved motifs between themselves and with hypothetical proteins derived from the genomes of M. truncatula, Vitis vinifera and Arabidopsis thaliana. However, they showed neither significant similarities to proteins of known function nor canonical metal-binding motifs. We conclude that FOR-like proteins are components of **forisomes** that are encoded by a well-defined gene family with relatives in taxa that lack **forisomes** . Since the mnemonic FOR is already registered and in use for unrelated genes, we suggest the acronym SEO (sieve element occlusion) for this family. The absence of binding sites for divalent cations suggests that the Ca-2 binding responsible for **forisome contraction** is achieved either by as yet unidentified additional proteins, or by SEO proteins through a novel, uncharacterized mechanism.
Identifiers--KeyWord Plus(R): **CRYSTALLINE** P-PROTEIN; CALCIUM-BINDING; PHLOEM; LEGUMES; MODEL; **CONTRACTILITY**; PREDICTION; TRANSPORT; BIOLOGY; PLANTS
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Title: GFP Tagging of Sieve Element Occlusion (SEO) Proteins Results in Green Fluorescent Forisomes

Abstract: **Forisomes** are Ca-2-driven, ATP-independent **contractile** protein bodies that reversibly occlude sieve elements in faboid legumes. They apparently consist of at...

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...absence of binding sites for divalent cations suggests that the Ca-2 binding responsible for **forisome contraction** is achieved either by as yet unidentified additional proteins, or by SEO proteins through a ...

...Identifiers-- **CRYSTALLINE** P-PROTEIN; CALCIUM-BINDING; PHLOEM; LEGUMES; MODEL; **CONTRACTILITY**; PREDICTION; TRANSPORT; BIOLOGY; PLANTS

8/9,K/2 (Item 2 from file: 34)

16373899 Genuine Article#: 158OO Number of References: 40

Title: Reversible birefringence suggests a role for molecular self-assembly in forisome contractility

Author(s): Peters WS (REPRINT) ; Schnetter R; Knoblauch M
Corporate Source: Indiana Univ Purdue Univ,Dept Biol,2101 E Coliseum Blvd/Ft Wayne//IN/46805 (REPRINT); Indiana Univ Purdue Univ,Dept Biol,Ft Wayne//IN/46805; Univ Giessen,Inst Allgemeine Bot,D-35390 Giessen//Germany/; Washington State Univ,Sch Biol Sci,Pullman//WA/99164

Journal: FUNCTIONAL PLANT BIOLOGY, 2007, V34, N4, P302-306
ISSN: 1445-4408 Publication date: 20070000
Publisher: CSIRO PUBLISHING, 150 OXFORD ST, PO BOX 1139, COLLINGWOOD, VICTORIA 3066, AUSTRALIA
Language: English Document Type: ARTICLE
Geographic Location: USA; Germany
Journal Subject Category: PLANT SCIENCES

Abstract: **Forisomes** are **contractile** protein bodies that control the effective diameter of the sieve elements of the faboid legumes by reversible, Ca2+-driven changes of shape. **Forisomes** consist of fibrils; we inferred from available electron-microscopical data (which necessarily provide images of fixed, non-functional **forisomes**) that a reversible assembly of ordered fibrillar arrays might be involved in the **contractile** mechanism. Here we examined functional **forisomes** isolated from **Vicia faba** L. by differential interference contrast microscopy and polarisation microscopy. We found them birefringent in the longitudinally expanded but not in the **contracted** state, showing 'parallel extinction' with the direction of vibration of the slow ray coinciding with their long axis (positive birefringence). These findings met predictions derived from the theory of form birefringence in rodlet composite bodies, and supported the idea of molecular self-assembly as a factor in **forisome contractility** .

Descriptors--Author Keywords: calcium-dependent **contractility** ; phloem transport ; **Vicia faba**
Identifiers--KeyWord Plus(R): BEAN PHASEOLUS-MULTIFLORUS; **CRYSTALLINE** P-PROTEIN; SIEVE ELEMENTS; FORM BIREFRINGENCE; PHLOEM; ULTRASTRUCTURE; TRANSLOCATION; INHIBITION; MICROSCOPY; ACTUATORS

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SABNIS DD, 1995, V9, P271, ENCY PLANT ANATOMY
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Title: Reversible birefringence suggests a role for molecular self-assembly in forisome contractility

Abstract: **Forisomes** are **contractile** protein bodies that control the effective diameter of the sieve elements of the faboid legumes by reversible, Ca2+-driven changes of shape. **Forisomes** consist of fibrils; we inferred from available electron-microscopical data (which necessarily provide images of fixed, non-functional **forisomes**) that a reversible assembly of ordered fibrillar arrays might be involved in the **contractile** mechanism. Here we examined functional **forisomes** isolated from **Vicia faba** L. by differential interference contrast microscopy and polarisation microscopy. We found them birefringent in the longitudinally expanded but not in the **contracted** state, showing 'parallel extinction' with the direction of vibration of the slow ray coinciding with...

...rodlet composite bodies, and supported the idea of molecular self-assembly as a factor in **forisome contractility** .

...Identifiers--BEAN PHASEOLUS-MULTIFLORUS; **CRYSTALLINE** P-PROTEIN; SIEVE ELEMENTS; FORM BIREFRINGENCE; PHLOEM; ULTRASTRUCTURE; TRANSLOCATION;

INHIBITION; MICROSCOPY; ACTUATORS

8/9,K/3 (Item 3 from file: 34)

15591813 Genuine Article#: 086TV Number of References: 31

Title: The geometry of the forisome **-sieve element-sieve plate complex in the phloem of** Vicia faba **L. leaflets**

Author(s): Peters WS (REPRINT) ; van Bel AJE; Knoblauch M
Corporate Source: Indiana Univ Purdue Univ,Dept Biol,2101 E Coliseum Blvd/Ft Wayne//IN/46805 (REPRINT); Indiana Univ Purdue Univ,Dept Biol,Ft Wayne//IN/46805; Univ Giessen,Inst Allgemeine Bot,D-35390 Giessen//Germany/; Washington State Univ,Sch Biol Sci,Pullman//WA/99164
(petersw@ipfw.edu; knoblauch@wsu.edu)

Journal: JOURNAL OF EXPERIMENTAL BOTANY, 2006, V57, N12 (SEP), P3091-3098
ISSN: 0022-0957 Publication date: 20060900
Publisher: OXFORD UNIV PRESS, GREAT CLARENDON ST, OXFORD OX2 6DP, ENGLAND
Language: English Document Type: ARTICLE
Geographic Location: USA; Germany
Journal Subject Category: PLANT SCIENCES

Abstract: **Forisomes** are **contractile** protein bodies that appear to control flux rates in the phloem of faboid legumes by reversibly plugging the sieve tubes. Plugging is triggered by Ca2+ which induces an anisotropic deformation of **forisomes** , consisting of a longitudinal **contraction** and a radial expansion. By conventional light microscopy and confocal laser-scanning microscopy, the three-dimensional geometry of the **forisome** -sieve element-sieve plate complex in intact sieve tubes of leaflets of **Vicia faba** L. was reconstructed. **Forisomes** were mostly located close to sieve plates, and occasionally were observed drifting unrestrainedly along the sieve element, suggesting that they might be utilized as internal markers of flow direction. The diameter of **forisomes** in the resting state correlated with the diameter of their sieve elements, supporting the idea that radial expansion of **forisomes** is the geometric basis of reversible sieve tube plugging. Comparison of the present results regarding **forisome** geometry in situ with previously published data on **forisome** reactivity in vitro makes it questionable, however, whether **forisomes** are capable of completely sealing sieve tubes in V. faba leaves.

Descriptors--Author Keywords: Ca2+-dependent **contractility** ; **contractile** protein ; **forisome** ; phloem transport ; sieve element plugging ; sieve tube geometry ; **Vicia faba** L.
Identifiers--KeyWord Plus(R): BEAN PHASEOLUS-MULTIFLORUS; **CRYSTALLINE** P-PROTEIN; ULTRASTRUCTURE; TRANSLOCATION; INHIBITION; MICROSCOPY; VULGARIS; FEATURES; ROOTS; TUBES

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WEATHERLEY PE, 1968, V24, P159, INT REV CYTOL
WERGIN WP, 1970, V71, P365, PROTOPLASMA

Title: The geometry of the forisome **-sieve element-sieve plate complex in the phloem of** Vicia faba **L. leaflets**

Abstract: **Forisomes** are **contractile** protein bodies that appear to control flux rates in the phloem of faboid legumes by...

...plugging the sieve tubes. Plugging is triggered by Ca2+ which induces an anisotropic deformation of **forisomes** , consisting of a longitudinal **contraction** and a radial expansion. By conventional light microscopy and confocal laser-scanning microscopy, the three-dimensional geometry of the **forisome** -sieve element-sieve plate complex in intact sieve tubes of leaflets of **Vicia faba** L. was reconstructed. **Forisomes** were mostly located close to sieve plates, and occasionally were observed drifting unrestrainedly along the...

...suggesting that they might be utilized as internal markers of flow direction. The diameter of **forisomes** in the resting state correlated with the diameter of their sieve elements, supporting the idea that radial expansion of **forisomes** is the geometric basis of reversible sieve tube plugging. Comparison of the present results regarding **forisome** geometry in situ with previously published data on **forisome** reactivity in vitro makes it questionable, however, whether **forisomes** are capable of completely sealing sieve tubes in V. faba leaves.

...Identifiers--BEAN PHASEOLUS-MULTIFLORUS; **CRYSTALLINE** P-PROTEIN; ULTRASTRUCTURE; TRANSLOCATION; INHIBITION; MICROSCOPY; VULGARIS; FEATURES; ROOTS; TUBES

8/9,K/4 (Item 1 from file: 154)

DIALOG(R)File 154:MEDLINE(R)

15517406 PMID: 12942070

ATP-independent contractile **proteins from plants.**

Knoblauch Michael; Noll Gundula A; Muller Torsten; Prufer Dirk; Schneider-Huther Ingrid; Scharner Dorte; Van Bel Aart J E; Peters Winfried

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Emerging technologies are creating increasing interest in smart materials that may serve as actuators in micro- and nanodevices. Mechanically active polymers currently studied include a variety of materials. ATP-driven motor proteins, the actuators of living cells, possess promising characteristics, but their dependence on strictly defined chemical environments can be disadvantagous. Natural proteins that deform reversibly by entropic mechanisms might serve as models for artificial **contractile** polypeptides with useful functionality, but they are rare. Protein bodies from sieve elements of higher plants provide a novel example. sieve elements form microfluidics systems for pressure-driven transport of photo-assimilates throughout the plant. Unique protein bodies in the sieve elements of legumes act as cellular stopcocks, by undergoing a Ca2+-dependent conformational switch in which they plug the sieve element. In living cells, this reaction is probably controlled by Ca2+-transporters in the cell membrane. Here we report the rapid, reversible, anisotropic and ATP-independent **contractility** in these protein bodies in vitro. Considering the unique biological function of the legume ' **crystalloid** ' protein bodies and their **contractile** properties, we suggest to give them the distinctive name **forisome** ('gate-body'; from the Latin foris, the wing of a gate).
Descriptors: *Molecular Motor Proteins--chemistry--CH; *Nanotechnology--methods--MT; *Plant Proteins--chemistry--CH; *Plant Proteins--radiation effects--RE; * **Vicia faba** --chemistry--CH; Adenosine Triphosphate--chemistry--CH; Biomimetic Materials--chemistry--CH; Biomimetics--methods--MT; Elasticity; Electromagnetic Fields; Materials Testing--methods--MT; Motion; Protein Conformation; Stress, Mechanical; **Vicia faba** --metabolism--ME
CAS Registry No.: 0 (Molecular Motor Proteins); 0 (Plant Proteins); 56-65-5 (Adenosine Triphosphate)
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DIALOG(R)File 155:MEDLINE(R)

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